

Amendments to the Claims:

Please cancel claim 5303 without prejudice.

The following lists all claims and their status:

1-5213 (cancelled)

5214. (previously presented): A method of treating a coal formation in situ, comprising:

- allowing heat to transfer from heat sources to a part of the formation such that the heat from the heat sources pyrolyzes some hydrocarbon material in the part of the formation;
- producing pyrolysis products from the formation;
- heating a first section of the part with one or more of the heat sources to a temperature sufficient to allow generation of synthesis gas;
- providing a first synthesis gas generating fluid to the first section to generate a first synthesis gas;
- removing a portion of the first synthesis gas from the formation;
- heating a second section of the part with one more of the heat sources to a temperature sufficient to allow generation of synthesis gas having a H₂ to CO ratio greater than a H₂ to CO ratio of the first synthesis gas;
- providing a second synthesis gas generating fluid to the second section to generate a second synthesis gas;
- removing a portion of the second synthesis gas from the formation; and
- blending a portion of the first synthesis gas with a portion of the second synthesis gas to produce a blended synthesis gas having a selected H₂ to CO ratio.

5215. (previously presented): The method of claim 5214, wherein superposition of heat from at least two of the heat sources pyrolyzes at least some hydrocarbons in the part of the formation.

5216. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid and the second synthesis gas generating fluid comprise carbon dioxide.

5217. (previously presented): The method of claim 5214, further comprising controlling the temperature in the first section to control a composition of the first synthesis gas.

5218. (previously presented): The method of claim 5214, further comprising controlling the temperature in the second section to control a composition of the second synthesis gas.

5219. (previously presented): The method of claim 5214, wherein the selected ratio is controlled to be approximately 2:1 H₂ to CO.

5220. (previously presented): The method of claim 5214, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 H₂ to CO.

5221. (previously presented): The method of claim 5214, wherein the selected ratio is controlled to be approximately 3:1 H₂ to CO.

5222. (previously presented): The method of claim 5214, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 H₂ to CO.

5223. (previously presented): The method of claim 5214, further comprising providing at least a portion of the produced blended synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons.

5224. (previously presented): The method of claim 5223, wherein the condensable hydrocarbon synthesis process comprises a Fischer-Tropsch process.

5225. (previously presented): The method of claim 5224, further comprising cracking at least a portion of the condensable hydrocarbons to form middle distillates.

5226. (previously presented): The method of claim 5214, further comprising providing at least a portion of the produced blended synthesis gas to a catalytic methanation process to produce methane.

5227. (previously presented): The method of claim 5214, further comprising providing at least a portion of the produced blended synthesis gas to a methanol synthesis process to produce methanol.

5228. (previously presented): The method of claim 5214, further comprising providing at least a portion of the produced blended synthesis gas to a gasoline synthesis process to produce gasoline.

G1 5229. (previously presented): The method of claim 5214, wherein removing a portion of the second synthesis gas comprises withdrawing second synthesis gas through a production well, wherein a temperature of the production well adjacent to a production zone of the second synthesis gas is maintained at a substantially constant temperature such that the H_2 to CO ratio of the second synthesis gas is greater than the H_2 to CO ratio of the first synthesis gas.

5230. (previously presented): The method of claim 5214, wherein the first synthesis gas producing fluid comprises CO_2 and wherein the temperature of the first section is at a temperature that will result in conversion of CO_2 and carbon from the first section to CO to generate a CO rich first synthesis gas.

5231. (previously presented): The method of claim 5214, wherein the second synthesis gas producing fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons react in the formation to increase a H_2 concentration in the produced second synthesis gas.

5232. (previously presented): The method of claim 5214, wherein blending a portion of the first synthesis gas with a portion of the second synthesis gas comprises producing an intermediate mixture having a H_2 to CO ratio of less than the selected ratio, and subjecting the intermediate mixture to a shift reaction to reduce an amount of CO and increase an amount of H_2 to produce the selected ratio of H_2 to CO.

5233. (previously presented): The method of claim 5214, further comprising removing an excess of first synthesis gas from the first section to have an excess of CO, subjecting the first synthesis gas to a shift reaction to reduce an amount of CO and increase an amount of H_2 before blending the first synthesis gas with the second synthesis gas.

5234. (previously presented): The method of claim 5214, further comprising removing the first synthesis gas from the formation under pressure, and passing removed first synthesis gas through a turbine to generate electricity.

5235. (previously presented): The method of claim 5214, further comprising removing the second synthesis gas from the formation under pressure, and passing removed second synthesis gas through a turbine to generate electricity.

GI 5236. (previously presented): The method of claim 5214, further comprising generating electricity from the blended synthesis gas using a fuel cell.

5237. (previously presented): The method of claim 5214, further comprising generating electricity from the blended synthesis gas using a fuel cell, separating carbon dioxide from a fluid exiting the fuel cell, and storing a portion of the separated carbon dioxide in a spent section of the formation.

5238. (previously presented): The method of claim 5214, further comprising using at least a portion of the blended synthesis gas as a combustion fuel for heating the formation.

5239. (previously presented): The method of claim 5214, wherein allowing the heat to transfer from the heat sources to the part of the formation increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

5240. (previously presented): The method of claim 5214, wherein allowing the heat to transfer from the heat sources increases a permeability of a majority of the part to greater than about 100 millidarcy.

5241. (previously presented): The method of claim 5214, further comprising heating the first section when providing the first synthesis gas generating fluid to inhibit temperature decrease in the first section during synthesis gas generation.

GI 5242. (previously presented): The method of claim 5214, wherein the temperature sufficient to allow synthesis gas generation is in a range from approximately 400 °C to approximately 1200 °C.

5243. (previously presented): The method of claim 5214, wherein heating the first section to the temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more of the heat sources with heaters disposed in the wellbores, wherein the heaters are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material in the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material in the zones to produce heat in the zones; and

transferring heat from the zones to the first section.

5244. (previously presented): The method of claim 5214, wherein heating the second section to the temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more of the heat sources with heaters disposed in the wellbores, wherein the heaters are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material in the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material in the zones to produce heat in the zones; and

transferring heat from the zones to the second section.

5245. (previously presented): The method of claim 5214, wherein heating the first section to the temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid to the formation through a wellbore;

transporting the oxidizing fluid substantially by convection to the first section, wherein the first section is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

61 reacting the oxidizing fluid in the first section to generate heat and raise the temperature of the first section.

5246. (previously presented): The method of claim 5214, wherein heating the second section to the temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid to the formation through a wellbore;

transporting the oxidizing fluid substantially by convection to the second section, wherein the second section is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid in the second section to generate heat and raise the temperature of the second section.

5247. (previously presented): The method of claim 5214, wherein at least one of the heat sources comprises an electrical heater disposed in the formation.

5248. (previously presented): The method of claim 5214, wherein at least one of the heat sources comprises a natural distributor combustor.

5249. (previously presented): The method of claim 5214, wherein the heat sources comprise one or more heater wells, wherein at least one of the heater wells comprises a conduit disposed in the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

5250. (previously presented): The method of claim 5214, wherein heating the first section to the temperature sufficient to allow synthesis gas generation and providing the first synthesis gas generating fluid to the first section comprises introducing steam to the first section.

5251. (previously presented): The method of claim 5214, wherein heating the second section to the temperature sufficient to allow synthesis gas generation and providing the second synthesis gas generating fluid to the second section comprises introducing steam to the second section.

5252. (previously presented): The method of claim 5214, further comprising controlling the heating of the first section and provision of the first synthesis gas generating fluid to maintain a temperature in the first section above the temperature sufficient to generate synthesis gas.

5253. (previously presented): The method of claim 5214, further comprising controlling the heating of the second section and provision of the second synthesis gas generating fluid to maintain a temperature in the second section above the temperature sufficient to generate synthesis gas.

5254. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises liquid water.

5255. (previously presented): The method of claim 5214, wherein the second synthesis gas generating fluid comprises liquid water.

5256. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises steam.

5257. (previously presented): The method of claim 5214, wherein the second synthesis gas generating fluid comprises steam.

5258. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5259. (previously presented): The method of claim 5258, wherein a portion of the carbon dioxide in the first synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5260. (previously presented): The method of claim 5214, wherein the second synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5261. (previously presented): The method of claim 5260, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5262. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5263. (previously presented): The method of claim 5262, wherein a portion of the carbon dioxide in the first synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5264. (previously presented): The method of claim 5214, wherein the second synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5265. (previously presented): The method of claim 5264, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5266. (previously presented): The method of claim 5214, wherein providing the first synthesis gas generating fluid to the first section comprises raising a water table of the formation to allow water to flow to the first section.

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5267. (previously presented): The method of claim 5214, wherein providing the second synthesis gas generating fluid to the second section comprises raising a water table of the formation to allow water to flow to the second section.

5268. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction in the first section to increase a H₂ concentration in the produced first synthesis gas.

5269. (cancelled)

5270. (previously presented): The method of claim 5214, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in the first section to increase an energy content of the produced first synthesis gas.

5271. (previously presented): The method of claim 5214, wherein the second synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in at least the second section to increase an energy content of the second produced synthesis gas.

5272. (previously presented): The method of claim 5214, further comprising maintaining a pressure in the formation during synthesis gas generation, and passing produced blended synthesis gas through a turbine to generate electricity.

5273-5275 (cancelled)

5276. (previously presented): The method of claim 5214, further comprising using a portion of the first synthesis gas as a combustion fuel for one or more of the heat sources.

5277. (previously presented): The method of claim 5214, further comprising using a portion of the second synthesis gas as a combustion fuel for one or more of the heat sources.

5278. (previously presented): The method of claim 5214, further comprising using a portion of the blended synthesis gas as a combustion fuel for one or more of the heat sources.

5279. (previously presented): A method of treating a coal formation in situ, comprising:
allowing heat to transfer from heaters to a part of the formation such that the heat from one or more of the heaters pyrolyzes some hydrocarbon material in the part of the formation;
producing pyrolysis products from the formation;
heating a first section of the formation with one or more of the heaters to a temperature sufficient to allow generation of synthesis gas;
providing a first synthesis gas generating fluid to the first section to generate a first synthesis gas;
removing a portion of the first synthesis gas from the formation;

heating a second section of a formation with one or more of the heaters to a temperature sufficient to allow generation of synthesis gas having a H_2 to CO ratio greater than a H_2 to CO ratio of the first synthesis gas;

providing a second synthesis gas generating fluid to the second section to generate a second synthesis gas;

removing a portion of the second synthesis gas from the formation; and

blending a portion of the first synthesis gas with a portion of the second synthesis gas to produce a blended synthesis gas having a selected H_2 to CO ratio.

5280. (previously presented): The method of claim 5279, wherein superposition of heat from at least two of the heaters pyrolyzes at least some hydrocarbons in the part of the formation.

5281. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid and the second synthesis gas generating fluid comprise carbon dioxide.

5282. (previously presented): The method of claim 5279, further comprising controlling the temperature in the first section to control a composition of the first synthesis gas.

61 5283. (previously presented): The method of claim 5279, further comprising controlling the temperature in the second section to control a composition of the second synthesis gas.

5284. (previously presented): The method of claim 5279, wherein the selected ratio is controlled to be approximately 2:1 H_2 to CO.

5285. (previously presented): The method of claim 5279, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 H_2 to CO.

5286. (previously presented): The method of claim 5279, wherein the selected ratio is controlled to be approximately 3:1 H_2 to CO.

5287. (previously presented): The method of claim 5279, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 H₂ to CO.

5288. (previously presented): The method of claim 5279, further comprising providing at least a portion of the produced blended synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons.

5289. (previously presented): The method of claim 5288, wherein the condensable hydrocarbon synthesis process comprises a Fischer-Tropsch process.

5290. (previously presented): The method of claim 5289, further comprising cracking at least a portion of the condensable hydrocarbons to form middle distillates.

GI 5291. (previously presented): The method of claim 5279, further comprising providing at least a portion of the produced blended synthesis gas to a catalytic methanation process to produce methane.

5292. (previously presented): The method of claim 5279, further comprising providing at least a portion of the produced blended synthesis gas to a methanol-synthesis process to produce methanol.

5293. (previously presented): The method of claim 5279, further comprising providing at least a portion of the produced blended synthesis gas to a gasoline-synthesis process to produce gasoline.

5294. (previously presented): The method of claim 5279, wherein removing a portion of the second synthesis gas comprises withdrawing second synthesis gas through a production well, wherein a temperature of the production well adjacent to a production zone of the second synthesis gas is maintained at a substantially constant temperature such that the H₂ to CO ratio of the second synthesis gas is greater than the H₂ to CO ratio of the first synthesis gas.

5295. (previously presented): The method of claim 5279, wherein the first synthesis gas producing fluid comprises CO_2 and wherein the temperature of the first section is at a temperature that will result in conversion of CO_2 and carbon from the first section to CO to generate a CO rich first synthesis gas.

5296. (previously presented): The method of claim 5279, wherein the second synthesis gas producing fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons react in the formation to increase a H_2 concentration in the produced second synthesis gas.

5297. (previously presented): The method of claim 5279, wherein blending a portion of the first synthesis gas with a portion of the second synthesis gas comprises producing an intermediate mixture having a H_2 to CO ratio of less than the selected ratio, and subjecting the intermediate mixture to a shift reaction to reduce an amount of CO and increase an amount of H_2 to produce the selected ratio of H_2 to CO.

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5298. (previously presented): The method of claim 5279, further comprising removing an excess of first synthesis gas from the first section to have an excess of CO, subjecting the first synthesis gas to a shift reaction to reduce an amount of CO and increase an amount of H_2 before blending the first synthesis gas with the second synthesis gas.

5299. (previously presented): The method of claim 5279, further comprising removing the first synthesis gas from the formation under pressure, and passing removed first synthesis gas through a turbine to generate electricity.

5300. (previously presented): The method of claim 5279, further comprising removing the second synthesis gas from the formation under pressure, and passing removed second synthesis gas through a turbine to generate electricity.

5301. (previously presented): The method of claim 5279, further comprising generating electricity from the blended synthesis gas using a fuel cell.

5302. (previously presented): The method of claim 5279, further comprising generating electricity from the blended synthesis gas using a fuel cell, separating carbon dioxide from a fluid exiting the fuel cell, and storing a portion of the separated carbon dioxide in a spent section of the formation.

5303. (cancelled)

5304. (previously presented): The method of claim 5279, wherein allowing the heat to transfer from the heaters to the part of the formation increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

GI 5305. (previously presented): The method of claim 5279, wherein allowing the heat to transfer from the heaters increases a permeability of a majority of the part to greater than about 100 millidarcy.

5306. (previously presented): The method of claim 5279, further comprising heating the first section when providing the first synthesis gas generating fluid to inhibit temperature decrease in the first section during synthesis gas generation.

5307. (previously presented): The method of claim 5279, wherein the temperature sufficient to allow synthesis gas generation is in a range from approximately 400 °C to approximately 1200 °C.

5308. (previously presented): The method of claim 5279, wherein heating the first section to the temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more of the heaters with heaters disposed in the wellbores, wherein the heaters disposed in the wellbores are configured to raise temperatures

of the zones to temperatures sufficient to support reaction of hydrocarbon material in the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material in the zones to produce heat in the zones; and

transferring heat from the zones to the first section.

5309. (previously presented): The method of claim 5279, wherein heating the second section to the temperature sufficient to allow synthesis gas generation comprises:

heating zones adjacent to wellbores of one or more of the heaters with heaters disposed in the wellbores, wherein the heaters disposed in the wellbores are configured to raise temperatures of the zones to temperatures sufficient to support reaction of hydrocarbon material in the zones with an oxidizing fluid;

introducing the oxidizing fluid to the zones substantially by diffusion;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbon material in the zones to produce heat in the zones; and

transferring heat from the zones to the second section.

61 5310. (previously presented): The method of claim 5279, wherein heating the first section to the temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid to the formation through a wellbore;

transporting the oxidizing fluid substantially by convection to the first section, wherein the first section is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid in the first section to generate heat and raise the temperature of the first section.

5311. (previously presented): The method of claim 5279, wherein heating the second section to the temperature sufficient to allow synthesis gas generation comprises:

introducing an oxidizing fluid to the formation through a wellbore;

transporting the oxidizing fluid substantially by convection to the second section, wherein the second section is at a temperature sufficient to support an oxidation reaction with the oxidizing fluid; and

reacting the oxidizing fluid in the second section to generate heat and raise the temperature of the second section.

5312. (previously presented): The method of claim 5279, wherein at least one of the heaters comprises an electrical heater disposed in the formation.

5313. (previously presented): The method of claim 5279, wherein at least one of the heaters comprises a natural distributor combustor.

5314. (previously presented): The method of claim 5279, wherein the heaters comprise one or more heater wells, wherein at least one heater well comprises a conduit disposed in the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

61 5315. (previously presented): The method of claim 5279, wherein heating the first section to the temperature sufficient to allow synthesis gas generation and providing the first synthesis gas generating fluid to the first section comprises introducing steam to the first section.

5316. (previously presented): The method of claim 5279, wherein heating the second section to the temperature sufficient to allow synthesis gas generation and providing the second synthesis gas generating fluid to the second section comprises introducing steam to the second section.

5317. (previously presented): The method of claim 5279, further comprising controlling the heating of the first section and provision of the first synthesis gas generating fluid to maintain a temperature in the first section above the temperature sufficient to generate synthesis gas.

5318. (previously presented): The method of claim 5279, further comprising controlling the heating of the second section and provision of the second synthesis gas generating fluid to

maintain a temperature in the second section above the temperature sufficient to generate synthesis gas.

5319. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises liquid water.

5320. (previously presented): The method of claim 5279, wherein the second synthesis gas generating fluid comprises liquid water.

5321. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises steam.

5322. (previously presented): The method of claim 5279, wherein the second synthesis gas generating fluid comprises steam.

GI 5323. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5324. (previously presented): The method of claim 5323, wherein a portion of the carbon dioxide in the first synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5325. (previously presented): The method of claim 5279, wherein the second synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5326. (previously presented): The method of claim 5325, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5327. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5328. (previously presented): The method of claim 5327, wherein a portion of the carbon dioxide in the first synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5329. (previously presented): The method of claim 5279, wherein the second synthesis gas generating fluid comprises carbon dioxide, and wherein a portion of the carbon dioxide reacts with carbon in the formation to generate carbon monoxide.

5330. (previously presented): The method of claim 5329, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

61 5331. (previously presented): The method of claim 5279, wherein providing the first synthesis gas generating fluid to the first section comprises raising a water table of the formation to allow water to flow to the first section.

5332. (previously presented): The method of claim 5279, wherein providing the second synthesis gas generating fluid to the second section comprises raising a water table of the formation to allow water to flow to the second section.

5333. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction in the first section to increase a H₂ concentration in the produced first synthesis gas.

5334. (cancelled)

5335. (previously presented): The method of claim 5279, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in the first section to increase an energy content of the produced first synthesis gas.

5336. (previously presented): The method of claim 5279, wherein the second synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in at least the second section to increase an energy content of the second produced synthesis gas.

5337. (previously presented): The method of claim 5279, further comprising maintaining a pressure in the formation during synthesis gas generation, and passing produced blended synthesis gas through a turbine to generate electricity.

5338-5340 (cancelled)

G1 5341. (previously presented): The method of claim 5279, further comprising using a portion of the first synthesis gas as a combustion fuel for one or more of the heaters.

5342. (previously presented): The method of claim 5279, further comprising using a portion of the second synthesis gas as a combustion fuel for one or more of the heaters.

5343. (previously presented): The method of claim 5279, further comprising using a portion of the blended synthesis gas as a combustion fuel for the one or more heaters.

5344. (new): A method of treating a coal formation in situ, comprising:

G2 allowing heat to transfer from heat sources to a part of the formation such that the heat from the heat sources pyrolyzes some hydrocarbon material in the part of the formation;

producing pyrolysis products from the formation;
heating a first section of the part with one or more of the heat sources to a temperature sufficient to allow generation of synthesis gas;
providing a first synthesis gas generating fluid to the first section to generate a first synthesis gas, wherein the first synthesis gas generating fluid comprises carbon dioxide;
removing a portion of the first synthesis gas from the formation;
heating a second section of the part with one more of the heat sources to a temperature sufficient to allow generation of synthesis gas having a H₂ to CO ratio greater than a H₂ to CO ratio of the first synthesis gas;
providing a second synthesis gas generating fluid to the second section to generate a second synthesis gas;
removing a portion of the second synthesis gas from the formation; and
blending a portion of the first synthesis gas with a portion of the second synthesis gas to produce a blended synthesis gas having a selected H₂ to CO ratio.

5345. (new): The method of claim 5344, further comprising controlling the temperature in the first section to control a composition of the first synthesis gas.

62 5346. (new): The method of claim 5344, further comprising controlling the temperature in the second section to control a composition of the second synthesis gas.

5347. (new): The method of claim 5344, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 H₂ to CO.

5348. (new): The method of claim 5344, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 H₂ to CO.

5349. (new): The method of claim 5344, wherein removing a portion of the second synthesis gas comprises withdrawing second synthesis gas through a production well, wherein a temperature of the production well adjacent to a production zone of the second synthesis gas is

maintained at a substantially constant temperature such that the H₂ to CO ratio of the second synthesis gas is greater than the H₂ to CO ratio of the first synthesis gas.

5350. (new): The method of claim 5344, wherein the second synthesis gas producing fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons react in the formation to increase a H₂ concentration in the produced second synthesis gas.

5351. (new): The method of claim 5344, wherein blending a portion of the first synthesis gas with a portion of the second synthesis gas comprises producing an intermediate mixture having a H₂ to CO ratio of less than the selected ratio, and subjecting the intermediate mixture to a shift reaction to reduce an amount of CO and increase an amount of H₂ to produce the selected ratio of H₂ to CO.

5352. (new): The method of claim 5344, further comprising heating the first section when providing the first synthesis gas generating fluid to inhibit temperature decrease in the first section during synthesis gas generation.

G2 5353. (new): The method of claim 5344, wherein the temperature sufficient to allow synthesis gas generation is in a range from approximately 400 °C to approximately 1200 °C.

5354. (new): The method of claim 5344, wherein at least one of the heat sources comprises an electrical heater disposed in the formation.

5355. (new): The method of claim 5344, wherein at least one of the heat sources comprises a natural distributor combustor.

5356. (new): The method of claim 5344, wherein the heat sources comprise one or more heater wells, wherein at least one of the heater wells comprises a conduit disposed in the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

5357. (new): The method of claim 5344, wherein the first synthesis gas generating fluid comprises liquid water.

5358. (new): The method of claim 5344, wherein the second synthesis gas generating fluid comprises liquid water.

5359. (new): The method of claim 5344, wherein the first synthesis gas generating fluid comprises steam.

5360. (new): The method of claim 5344, wherein the second synthesis gas generating fluid comprises steam.

5361. (new): The method of claim 5344, wherein the first synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5362. (new): The method of claim 5344, wherein the second synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5363. (new): The method of claim 5362, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5364. (new): The method of claim 5344, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons are subjected to a reaction in the first section to increase a H₂ concentration in the produced first synthesis gas.

5365. (new): The method of claim 5344, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in the first section to increase an energy content of the produced first synthesis gas.

5366. (new): The method of claim 5344, wherein the second synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in at least the second section to increase an energy content of the second produced synthesis gas.

5367. (new): The method of claim 5344, further comprising providing at least a portion of the produced blended synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons

5368. (new): The method of claim 5344, further comprising removing the first synthesis gas from the formation under pressure, and passing removed first synthesis gas through a turbine to generate electricity.

62 5369. (new): The method of claim 5344, further comprising removing the second synthesis gas from the formation under pressure, and passing removed second synthesis gas through a turbine to generate electricity.

5370. (new): The method of claim 5344, further comprising providing at least a portion of the produced blended synthesis gas to a fuel cell.

5371. (new): A method of treating a coal formation in situ, comprising:
allowing heat to transfer from heaters to a part of the formation such that the heat from one or more of the heaters pyrolyzes some hydrocarbon material in the part of the formation;
producing pyrolysis products from the formation;

heating a first section of the formation with one or more of the heaters to a temperature sufficient to allow generation of synthesis gas;
providing a first synthesis gas generating fluid to the first section to generate a first synthesis gas;
removing a portion of the first synthesis gas from the formation;
heating a second section of a formation with one or more of the heaters to a temperature sufficient to allow generation of synthesis gas having a H₂ to CO ratio greater than a H₂ to CO ratio of the first synthesis gas;
providing a second synthesis gas generating fluid to the second section to generate a second synthesis gas;
removing a portion of the second synthesis gas from the formation;
blending a portion of the first synthesis gas with a portion of the second synthesis gas to produce a blended synthesis gas having a selected H₂ to CO ratio; and
using at least a portion of the blended synthesis gas as a combustion fuel for heating the formation.

5372. (new): The method of claim 5371, further comprising controlling the temperature in the first section to control a composition of the first synthesis gas.

5373. (new): The method of claim 5371, further comprising controlling the temperature in the second section to control a composition of the second synthesis gas.

5374. (new): The method of claim 5371, wherein the selected ratio is controlled to range from approximately 1.8:1 to approximately 2.2:1 H₂ to CO.

5375. (new): The method of claim 5371, wherein the selected ratio is controlled to range from approximately 2.8:1 to approximately 3.2:1 H₂ to CO.

5376. (new): The method of claim 5371, wherein removing a portion of the second synthesis gas comprises withdrawing second synthesis gas through a production well, wherein a

temperature of the production well adjacent to a production zone of the second synthesis gas is maintained at a substantially constant temperature such that the H₂ to CO ratio of the second synthesis gas is greater than the H₂ to CO ratio of the first synthesis gas.

5377. (new): The method of claim 5371, wherein the second synthesis gas producing fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a portion of the hydrocarbons react in the formation to increase a H₂ concentration in the produced second synthesis gas.

5378. (new): The method of claim 5371, wherein blending a portion of the first synthesis gas with a portion of the second synthesis gas comprises producing an intermediate mixture having a H₂ to CO ratio of less than the selected ratio, and subjecting the intermediate mixture to a shift reaction to reduce an amount of CO and increase an amount of H₂ to produce the selected ratio of H₂ to CO.

5379. (new): The method of claim 5371, further comprising heating the first section when providing the first synthesis gas generating fluid to inhibit temperature decrease in the first section during synthesis gas generation.

5380. (new): The method of claim 5371, wherein the temperature sufficient to allow synthesis gas generation is in a range from approximately 400 °C to approximately 1200 °C.

5381. (new): The method of claim 5371, wherein at least one of the heaters comprises an electrical heater disposed in the formation.

5382. (new): The method of claim 5371, wherein at least one of the heaters comprises a natural distributor combustor.

5383. (new): The method of claim 5371, wherein the heaters comprise one or more heater wells, wherein at least one heater well comprises a conduit disposed in the formation, and further comprising heating the conduit by flowing a hot fluid through the conduit.

5384. (new): The method of claim 5371, wherein the first synthesis gas generating fluid comprises liquid water.

5385. (new): The method of claim 5371, wherein the second synthesis gas generating fluid comprises liquid water.

5386. (new): The method of claim 5371, wherein the first synthesis gas generating fluid comprises steam.

5387. (new): The method of claim 5371, wherein the second synthesis gas generating fluid comprises steam.

5388. (new): The method of claim 5371, wherein the first synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

G2 5389. (new): The method of claim 5371, wherein the second synthesis gas generating fluid comprises water and carbon dioxide, wherein the carbon dioxide inhibits production of carbon dioxide from the part of the formation.

5390. (new): The method of claim 5389, wherein a portion of the carbon dioxide in the second synthesis gas generating fluid comprises carbon dioxide removed from the formation.

5391. (new): The method of claim 5371, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers less than 5, and wherein at least a

portion of the hydrocarbons are subjected to a reaction in the first section to increase a H₂ concentration in the produced first synthesis gas.

5392. (new): The method of claim 5371, wherein the first synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in the first section to increase an energy content of the produced first synthesis gas.

5393. (new): The method of claim 5371, wherein the second synthesis gas generating fluid comprises water and hydrocarbons having carbon numbers greater than 4, and wherein at least a portion of the hydrocarbons react in at least the second section to increase an energy content of the second produced synthesis gas.

62 5394. (new): The method of claim 5371, further comprising providing at least a portion of the produced blended synthesis gas to a condensable hydrocarbon synthesis process to produce condensable hydrocarbons

5395. (new): The method of claim 5371, further comprising providing at least a portion of the produced blended synthesis gas to a fuel cell.
